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SILVICAL LEAFLETS 1 - 53



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1953

## SILVICAL LEAFLETS

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|------------------------|-----------------------|
| 1. Alpine fir          | 21. Jeffrey pine      |
| 2. Port Orford cedar   | 22. Amabilis fir      |
| 3. Engelmann spruce    | 23. Bristle-cone pine |
| 4. White fir           | 24. Bristle-cone fir  |
| 5. Lowland fir         | 25. Cottonwood        |
| 6. Sitka spruce        | 26. Foxtail pine      |
| 7. Noble fir           | 27. Torrey pine       |
| 8. Red fir             | 28. Black spruce      |
| 9. Incense cedar       | 29. Blue spruce       |
| 10. Bigcone spruce     | 30. California        |
| 11. Giant arbovitae    | swamp pine            |
| 12. Yellow cedar       | 31. Black hemlock     |
| 13. Western white pine | 32. Tamarack          |
| 14. Western larch      | 33. Digger pine       |
| 15. White spruce       | 34. Coulter pine      |
| 16. Single-leaf pinon  | 35. Alpine larch      |
| 17. Four-leaf pinon    | 36. Knobcone pine     |
| 18. Redwood            | 37. White-bark pine   |
| 19. Bigtree            | 38. Paper birch       |
| 20. Weeping spruce     | 39. Monterey pine     |

40. Swamp cottonwood

41. Chestnut oak

42. Sugar maple
43. Red or Norway pine
44. Jack pine
45. Western hemlock
46. Limber pine
47. Pinon pine
48. Pignut hickory
49. Shagbark hickory
50. Big shellbark; king-nut hickory
51. Broadleaf maple.
52. Oregon oak
53. Red alder





38-500

*Ala-29*

United States Department of Agriculture,  
FOREST SERVICE,  
GIFFORD PINCHOT, Forester.

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SILVICAL LEAFLET 1.

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ALPINE FIR.

*Abies lasiocarpa* (Hook.) Nutt.

Alpine fir is of little commercial importance. It grows with Engelmann spruce at high altitudes, in dense stands which are of great value as protection forests and as agents in regulating stream supply. The tree is a promising source of pulpwood for the future, but the fact that it grows only at high altitudes will make logging expensive.

RANGE AND OCCURRENCE.

Alpine fir is one of the most widely distributed of the western conifers. Its range extends from Alaska to southern Arizona and New Mexico, and from the mountains of the Pacific Coast to the Rockies. It leaves the coast in Oregon, and does not occur in California.

Alpine fir grows in cool and moist situations. It is usually present at timber line, and reaches its lower altitudinal limits in protected valleys with abundant moisture. In Alaska its altitudinal range is narrow, extending from sea level to timber line at 3,000 or 4,000 feet. It is more abundant on the east than on the west slopes of the Alaskan coast mountains. Throughout the northern coast mountains and the Rocky Mountain region its altitudinal range is wide. It occurs here on all slopes, but grows best on northerly aspects at high altitudes. From these it extends upward to timber line, at elevations of from 10,000 to 12,000 feet, and downward along streams and in cool, protected valleys to 6,000, and occasionally, in the Bitterroot Mountains of Idaho, to 3,000 feet. At the southern limit of its range its altitudinal extent is again narrow, since favorable moisture conditions in the South are at a much higher elevation. In the San Francisco Mountains of Arizona it grows on northerly slopes, at elevations of from 9,000 to 11,000 feet.

CLIMATE.

Alpine fir is adapted to a rigorous climate, and has extended its range farther north than have any others of the coast firs. Its northern limit is marked by blighting north winds during the winter; by weak insolation, due to high altitude and extreme cloudiness; by excessive pre-

precipitation, averaging over 60 inches of rain and from 2 to 5 feet of snow; and by a minimum temperature of about  $40^{\circ}$  F. below zero. Toward its southern limit it receives much more abundant sunlight, with less humidity and precipitation—the latter averages about 25 inches, largely in the form of snow. It experiences a maximum temperature of about  $90^{\circ}$  F. In the Rocky Mountains the tree finds the most unfavorable climatic conditions, with a very short vegetative season and constant frosts.

#### HABIT.

Alpine fir is a small tree, usually from 50 to 90 feet high and from 10 to 24 inches in diameter, breasthigh. The crown is narrow, symmetrical, and spire-shaped, and except in dense stands reaches close to the ground. The stem is straight and limby, and has a rapid taper. The root system is superficial, without much lateral spread, and is easily killed by ground fires. Leaves, twigs, and bark are resinous and highly inflammable, and the low crown, which reaches almost to the ground, is a menace to the forest because it serves to start crown fires.

The tree is short-lived and of slow growth. The rate of height growth is greatest between the twentieth and the fortieth years, and the most rapid growth in diameter occurs between the thirtieth and the seventy-fifth years. Because of the rapid taper, few trees below 14 inches in diameter are merchantable. This diameter is usually reached at an age of about 140 years. The natural age limit of Alpine fir varies with altitude and quality of locality as well as with geographical location. As a rule, scattered trees in the stand are more or less seriously attacked by ground rot at the age of 125 years, and decadence is general among trees from 200 to 250 years old. Few trees exceed an age of 300 years.

Alpine fir frequently exhibits a tendency to reproduce by layering. The lower branches, which are procumbent, become covered with earth, roots are produced, and the branches increase in size and assume an upward curve. It is doubtful, however, if the tree ever actually reproduces itself in this manner. The tendency becomes more apparent with increasing altitude, the main trunk becoming shorter while the layered branches form a saucer-like whorl at its base.

#### ASSOCIATED SPECIES.

Alpine fir forms pure stands of small extent, and grows also in mixture with other species. In Alaska its chief associate is black hemlock. In Washington it is found at its upper limits with black hemlock and occasionally yellow cedar and white-bark pine, and at lower altitudes with noble and amabilis firs. In Oregon it grows with black hemlock, Engelmann spruce, western white pine, and noble fir. In the northern Rocky Mountains it is associated near its lower limits with Engelmann



spruce, blue spruce, Douglas fir, and lodgepole pine; and in addition on ridges and slopes, with limber pine, white-bark pine, and juniper. In Colorado its chief associates are Engelmann spruce and aspen. Throughout the Rocky Mountains it often occurs in pure groups in open, park-like stands; but large, pure stands are rare. In the Uinta Mountains of Utah it is associated with lodgepole pine, Engelmann spruce, and Douglas fir. In northern New Mexico and Arizona it forms open forests with Engelmann spruce and white fir. In southern Arizona it grows in very dense stands on high mountain slopes and table-lands with Engelmann spruce.

#### SOIL AND MOISTURE.

For its best development, Alpine fir requires a fairly deep, loose, moist soil, though it will grow in swampy situations and on thin soils of the poorest and driest kind. Its soil moisture requirements limit distribution to canyon bottoms and to elevations where snowfall is heavy. It is less exacting with regard to soil moisture than Engelmann spruce, however, and grows both in marshy places too wet and on soils too dry for spruce. It does not thrive on heavy clay soils.

#### TOLERANCE.

Alpine fir is slightly less tolerant of shade than Engelmann spruce. It is more tolerant than the other species with which it grows, and is able to recover and grow rapidly after being suppressed. It is more tolerant, and will grow in denser stands, at lower altitudes than at high ones.

#### REPRODUCTION.

Alpine fir produces seed in fair quantities. It begins to bear cones as early as the twentieth year, and produces some seed each year, with periods of heavy production at three-year intervals. Often it completely fails to perfect its cones and for a year or two puts forth no seed. The seeds have a high percentage of germination, which accounts for the fact that alpine fir is usually well represented in the reproduction in a mixed forest. Seedlings are most abundant to the north of groups of seed trees and under their protecting branches. Small protected openings in large groups of trees nearly always show abundant reproduction of alpine fir seedlings. The seeds do not require a mineral seed bed for germination, but under dense stands are able to germinate in the duff.

The cones mature in the fall of the first year, and the seed is released by the drying and falling of the scales. The seeds are winged and so may be carried by the wind.

